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Predicting the Intention to Use Mobile Health Applications Among Young Adults in Malaysia

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ABSTRACT

Today's healthcare system faces several issues, including inefficiency, inequality, and inefficiency. Mobile devices with complex features and user-friendly interfaces have emerged as one of the most important ways to address concerns, opening up new mHealth in the mobile applications industry. Therefore, this study aims to investigate the variables affecting intention to use mobile health applications among young adults in Malaysia. This study used a purposive sampling technique with a correlational cross-sectional research design. The data utilised to empirically assess the suggested model, which is an extension of UTAUT, was collected through an online survey among mobile users. To analyse 312 data sets, smart partial least square was used. The findings revealed that the intention to use mobile health applications is favourably influenced by performance expectancy, facilitating conditions, and health consciousness. However, effort expectancy and social influence do not influence the intention to use mobile health applications. To boost the application of mHealth, it might be necessary for relevant authorities to recognise the obstacles to their use.

1. Introduction

Smartphones have evolved into one of the most widely used and affordable platforms for health care and research due to the surge in smartphone ownership and usage. In addition, smartphones are widely used by people of many ages, races, and socioeconomic statuses, making it simple and affordable for researchers to contact a variety of population-level samples. According to the World Health Organization, mobile health (mHealth) is a public health practice enabled by mobile technologies (e.g., mobile phones and patient monitoring devices) and other wireless devices [1]. In general, mHealth caters to all age groups, including elderly persons and maternal-child groups [2,3]. In particular, the use of mobile health (mHealth) apps, such as smartphones, tablets, smartwatches, and other devices, to monitor and manage participants' health has grown in the research community. These applications improved the workflow of in-hospital care and public health services during the

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COVID-19 epidemic. They also made healthcare access easier [4,5]. Along with empowering medical providers, mHealth also gave patients more influence over managing their ailments, especially chronic conditions that can be constantly observed.

Despite the wealth of research demonstrating the advantages of mHealth, there is still room for improvement in public adoption, particularly among young adults [1]. Different demographics have shown different usage patterns for mHealth [7]. One element that has been linked to the adoption of mHealth is socioeconomic characteristics [9]. Even though young adults are familiar with mobile applications, they still encounter difficulties when using mHealth technology [1]. Young people, who will make up most of the workforce in the future, are anticipated to thrive at work and embrace cutting-edge abilities, such as utilizing information and technology connected to wellness and lifestyle. The current COVID-19 epidemic has also increased the number of mHealth apps downloaded and used, underlining the need for technology-based remote monitoring and diagnosis for further development in contemporary health care [9].

The pandemic is anticipated to change the method of receiving and sending information to more advanced methods. The quick spread of the virus, as well as the severity of the sickness in a significant number of individuals, have demanded exceptional public health measures. In worldwide, medical facilities are fighting to find a solution and taking exceptional steps. Several alternatives for health professionals to discover, treat, and monitor COVID-19 patients effectively and efficiently, as well as to prevent the disease from spreading further [6].

The convenience of mHealth apps is by far their most significant benefit. Unlike conventional on-site study settings, mobile health apps can be conveniently accessible whenever and whenever the participant wants. Apps for remote evaluation enable participants to visit sites less frequently, significantly decreasing the time and travel costs associated with taking part in laboratory investigations. Participants will find it simpler to do repeated testing and contribute real-time data based on their everyday experiences when obstacles are lower. Some mHealth research apps also let participants speak with their doctors directly through the app, which could increase the program's effectiveness in achieving its objectives.

Therefore, to fill the gaps, this study aims to determine the relationship between effort expectancy (EE), performance expectancy (PE), social influence (SI), facilitating conditions (FC), and health consciousness (HC) toward the intention to use mHealth (ITUM) among young adults in Malaysia. The outcomes of this study were helpful, especially for relevant authorities, the Ministry of Health, to recognize the obstacles to increasing the use of mHealth among young adults. The benefits of using mHealth in terms of reducing waiting time and tracking history should be obtained by all users to increase awareness of monitoring health.

2. Methodology

2.1 Research Design

We employed the quantitative research approach to achieve the objective of the study by empirically testing UTAUT theory in the context of mHealth. A cross-sectional survey was carried out among individuals using mobile applications to understand the influence of EE, PE, SI, and FC on young adults' intention to use mHealth. The study collects data from sampled respondents by using an online survey platform. Researchers may swiftly gather large amounts of data with an online survey, which also helps reduce errors in the process [10].

2.2 Sample and Procedures

Owing to the sampling frame's unavailability, it was decided to gather data for this study using purposive sampling. The researchers selected young adult respondents in Malaysia who are mobile users. Thus, they are expected to understand mobile health applications. The purposive sampling approach was appropriate for this study because the respondents had to meet the prerequisites. Next, a Google Forms-based online survey was created, and the questionnaire link was disseminated to the respondents via social media.

According to Hair *et al*., [10], given that the study's data analysis tools as Smart Partial Least Squares, the sample size should be defined by the power of analysis, with the bare minimum of samples being dictated by the complexity of the model. According to Green's table [11], the five predictors needed a minimum sample size of 95 participants, and the study's medium effect size was 0.15 with a 0.05 degree of confidence. Thus, because it substantially surpasses the minimum sample size criterion, the sample size of 312 is considered adequate for this investigation.

2.3 Survey Instrument

The questionnaire was administered in English and Malay to accommodate respondents who cannot speak English. The official language of Malaysians is Bahasa Malaysia. Based on the proposed extended UTAUT used in this study, the questionnaire survey with two separated sections was conducted. All the items were adopted from successful previous studies and adapted for suitable of the context in this present study. The instrument is separated into two sections.

Section one presents the demographic information of respondents. The second section consists of constructs influencing intention to use mHealth among young adults using the 5-point Likert scale ranging from "1" strongly disagree to "5" as strongly agree". In contrast, the dependent variable of intention to use mHealth among young adults using the 7-point Likert scale ranging from "1" strongly disagree to "7" as strongly agree to avoid common method bias problem.

2.4 Data Analysis

The data analysis was conducted using the Smart PLS 3.3. SEM is a valuable behavioural and social sciences tool when numerous constructs are unobservable. SEM assists researchers in determining the one-dimensionality, dependability, and validity of each concept. Hence, this study utilizes the PLS-SEM to analyse the data collected to achieve the research questions and objectives.

3. Results

3.1 Respondent's Profile

Most respondents were young adults in Malaysia; most were female (50%), and the remaining (50%) were male. Regarding their age, the age of the respondents varied between 23 and 27 years; is the majority in this study that represent (45.5%) were aged between 18 and 22 years, (44.9%) of them were aged from 28 and 32 years (9.6%). As for the respondents' ethnicity, most were Malay (51.6%) compared to Chinese (27.6%), Indian (16.7%), and others (4.2%). In terms of education, about (57.4%) of the sampled respondents hold a Bachelor degree, with (25%) being a diploma. Only (1.3%) of respondents were doctoral most of the respondents were from SPM (12.8%) and Master's degrees (3.5%). In terms of Residential area, almost half of the respondents held an urban (46.2%), with (21.5%) being suburban. Only (32.4%) of respondents were rural. Lastly, the descriptive analysis

revealed that most of the respondent's Religions, most were Muslim (51.3%) compared to Buddha (15.7%), Hindu (27.6%), Christian (3.8 %), and others (1.6%).

Table 1
Respondent's profile

Characteristics	Frequency	Percentage (%)
Gender		
Male	156	50.0
Female	156	50.0
Age		
18-22 years	140	44.9
23-27 years	142	45.5
28-32 years	30	9.6
Race		
Malay	161	51.6
Chinese	86	27.6
Indian	52	16.7
Others	13	4.2
Highest Education		
SPM	40	12.8
Diploma	78	25.0
Degree	179	57.4
Master's degree	11	3.5
Doctoral	4	1.3
Residential		
Urban	144	46.2
Suburban	67	21.5
Rural	101	32.4
Religion		
Muslim	160	51.3
Buddha	49	15.7
Hindu	86	27.6
Christian	12	3.8
Others	5	1.6

3.2 Measurement Model Analysis

We assess the measurement model of our study (as depicted in Figure 1) using construct reliability (e.g., indicator loadings and Cronbach alpha-CA) and convergent validity (e.g., average variance extracted-AVE and composite reliability-CR). The convergent validity assesses whether the items belong to the same underlying construct.

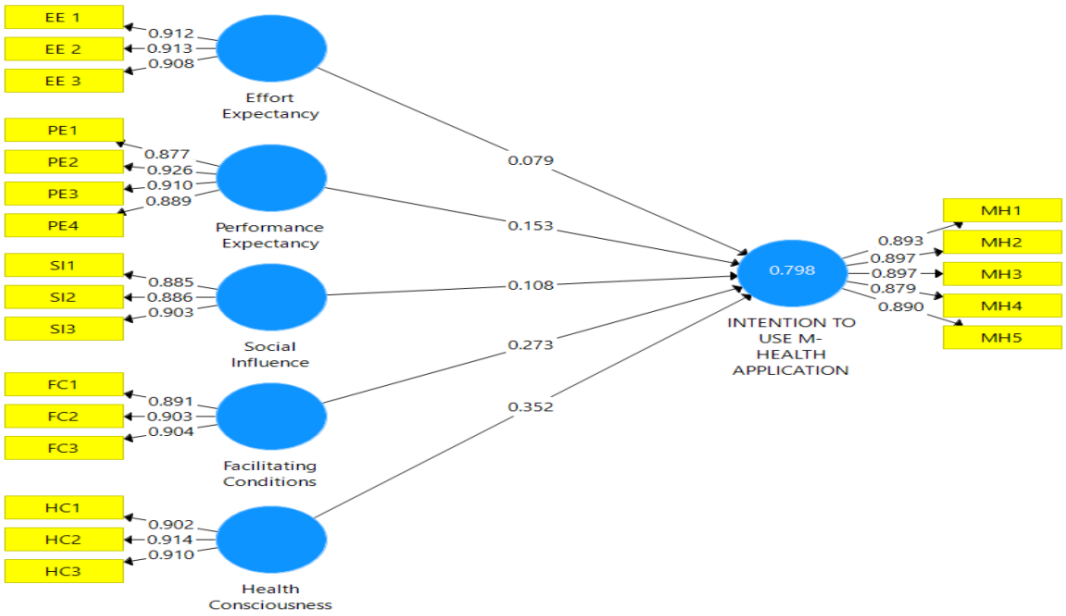

Fig. 1. Measurement model

Our indicator loadings are in the range of 0.885 and 0.926 (as depicted in Table 2), which are exceed the threshold of 0.5 [12]. The values of CA are higher than the threshold score of 0.700. Also, the values of CR are in the range of 0.021 and 0.951, higher than the 0.7 thresholds of CR. Meanwhile, the values of AVE are in the range of 0.794 to 0.830, which is above the 0.5 threshold score for AVE. Thus, the study's constructs met the requirements for convergent validity and construct reliability following the results showed in Table 2.

Table 2
Convergent Validity

Constructs	Items	Loadings	AVE	CR
Effort Expectancy	Learning how to use mobile health applications is easy for me.	0.912	0.830	0.936
	My interaction with mobile health applications is clear and understandable.	0.913		
	It is easy for me to become skilful at using mobile health applications.	0.908		
Performance Expectancy	The mobile health application is useful to support critical aspects of my healthcare.	0.877	0.812	0.945
	The use of the mobile health application will enhance the effectiveness in managing my healthcare.	0.926		
	Using the mobile health application will improve my productivity.	0.910		
	Overall, the mobile health application will be useful in managing my healthcare.	0.889		
Social Influence	I am interested in trying to use the mobile health application when influenced by close acquaintances.	0.885	0.794	0.921
	I am easily influenced to try using the latest mobile health application.	0.886		
	I followed to use this mobile health application from a social media influencer.	0.903		
Facilitating Conditions	I have the resources necessary to use mobile health application.	0.891	0.809	0.927

	I know necessary to use the mobile health application.	0.903		
	The mobile health application is compatible with other technologies I use.	0.904		
Health Consciousness	Using the mobile health application is appropriate for my current situation.	0.902	0.826	0.934
	Using the mobile health application is convenient for me in all parts of my life.	0.914		
	I believe that using this mobile health application is a good fit for the way I manage my health.	0.910		
Intention To Use mHealth Application	I intend to use a mobile health application to consult health issues when needed in the future.	0.893	0.794	0.951
	I plan to use a mobile health application to consult health issues when needed in the future.	0.897		
	I am willing to tell others about the good aspects of the mobile health application.	0.897		
	I would recommend this mobile health application to others.	0.879		
	I will tell my family and friends about my good experiences using the mobile health application.	0.890		

Discriminant validity is evaluated using the HTMT criterion. The values should be at most 0.9 [13]. Table 3 illustrates the discriminant validity derived from the HTMT criterion and it have been proven that all values to be less than 0.9. We can summarize that the respondents were conscious that the provided constructs were different. Thus, the measurement items are reliable and valid for the present study.

Table 3
Discriminant Validity using HTMT Criterion

Construct	1	2	3	4	5	6	7
Effort Expectancy	0.793						
Facilitating Conditions	0.725	0.899					
Health Consciousness	0.714	0.837	0.818				
Intention to Use mHealth Application	0.733	0.839	0.848	0.891			
Performance Expectancy	0.812	0.821	0.816	0.818	0.789		
Social Influence	0.733	0.811	0.791	0.792	0.820	0.891	

3.3 Structural Model Analysis

It is important to establish that there is no serious problem of multicollinearity before assessing the structural model of the study. The VIF can be used to assess the constructs in a structural model for any problem of multicollinearity i.e., the regressors (IVs) in the model should not be highly correlated [12]. According to Table 4, every sample construct's VIF value is less than 3.3 [14], as can be shown. The current study demonstrates that collinearity was not a problem and allowing for the testing of hypotheses to proceed.

Table 4
Result of Direct Hypotheses

	Relationship	Std Beta	Std error	t value	P value	Confidence LL	Interval UL	VIF	Decision
H_1	Effort Expectancy → ITUM	0.079	0.050	1.578	0.058	0.000	0.167	3.093	Not Supported
H_2	Performance Expectancy →ITUM	0.153	0.073	2.102	0.018	0.021	0.271	3.298	Supported
H_3	Social Influence →ITUM	0.108	0.078	1.398	0.081	-0.018	0.248	2.110	Not Supported
H_4	Facilitating Condition → ITUM	0.273	0.080	3.422	0.000	0.142	0.399	1.004	Supported
H_5	Health Consciousness →ITUM	0.352	0.081	4.332	0.000	0.204	0.475	1.201	Supported

* Note: ITUM= Intention to use mHealth

As a rule of thumb, hypotheses are either accepted or rejected following whether the p-values (including the t-values) of the coefficient values of the relationships are significant at 1%, 5% or 10% levels. Also, hypotheses can also be accepted/supported when the coefficients values are within the lower level (LL) and upper level (UL) of their confidence interval values [15]. The present analysis used a bootstrapping approach with a resampling of 5,000. The findings for the direct effect show that three hypothesized relationships were accepted (H2, H4 & H5) while two were rejected (H1 & H3). Table 3 shows that the first hypothesis, effort expectancy, was not related to intention (ß = -0.079, t = 0.050, p < 0.058). The second hypothesis, performance expectancy, was positively related to intention (ß = 0.153, t = 2.102, p < 0.018). Next, the third hypothesis, social influence, was not related to intention (ß = 0.108, t = 1.398, p < 0.081). This is followed by the fourth hypothesis, facilitating condition was positively related to intention (ß = 0.273, t = 1.080, p < 0.000). Lastly, the fifth hypothesis, health consciousness, was positively related to intention (ß = 0.352, t = 4.332, p < 0.000). Table 4 indicates that PE, FC and HC significantly influence ITUM while EE and SI are not significant in explaining the variations in ITUM**.**

The study's findings show that EE does not influence young adults' intention to use mobile health applications. As a result, H1 was not supported. These findings contrast with the study by Alalwan *et al*., [18], who noted that EE and intention to use mHealth have a positive relationship since mHealth motivates consumers and makes adaptation easier. Consumers are probably like to use this mHealth technology because it is convenient to use and where they need it [25,26].

Second, PE positively influences young adults' intention to use mobile health applications. Thus, H2 was supported. According to Hoque & Sorwar [17], performance expectancy creates a positive relationship between consumer intentions to use mHealth because it can affect consumers regarding mobile applications usage.

Furthermore, the level of acceptance of new technologies depends greatly on their beliefs and societal influences [17]. However, evidence shows that SI does not significantly impact young adults' intention to utilise mobile health applications in Malaysia. It was inconsistent with previous findings in that found that social influence positively influences young adults' intention to use mHealth [18]. It is because social influence entails deliberate and unintentional attempts to persuade another individual to change their views, attitudes, or behaviour.

Next, according to the findings, FC positively influence the intention to use mHealth applications among young adults. Dwivedi *et al*., [19] also discovered that facilitating conditions impacted the use of mHealth applications. People of all ages can now experiment with and test out contemporary technology more easily as a result of technological innovation.

Finally, this study's findings point to the significance of health consciousness as a significant predictor of the intention to use mobile health applications among young adults in Malaysia. This finding is also inline to prior studies and scholars who have emphasized the importance of health consciousness in life [20,21,24]. Based on Cho *et al*., [20], when researching the impact of health consciousness on the prediction of health app use on smartphones, researchers used models of new technology or system use. This approach has been termed a wellness-oriented lifestyle, emphasizing how concerned people are about healthy lifestyle activities, including eating nutritious foods, exercising regularly, and caring for their surroundings [22].

4. Conclusions

Considering some of the initiatives introduced through the government's aspiration to improve the well-being of all, it is essential to enhance healthcare services to remain competitive. The mobile device industry has witnessed innovative progress and continuous expansion in the twenty-first century. Mobile devices have become an inevitable necessity for most individuals and are an undeniable force in reshaping and shaping sectors, including healthcare. Today's healthcare system faces several issues, including inefficiency, inequality, and inefficiency. Mobile devices with complex features and user-friendly interfaces have emerged as one of the most important ways to address concerns, opening up new mHealth in the mobile applications industry. The analysis revealed that PE, FC, and HC positively influence the intention to use mobile health applications. However, EE and SI do not influence the intention to use mobile health applications.

The adoption of mHealth in Malaysia and other developing countries gains strong theoretical support from this empirical investigation. This study extends the UTAUT theory of Venkatesh *et al*., [23] by integrating an additional construct (health consciousness) alongside the UTAUT construct and proposes a novel causal path connecting the crucial antecedents of intention to use mobile health applications. This other primary driver of mHealth use has been overlooked in previous research. By taking into account factors specific to this type of setting, this study contributes to the body of literature on the behaviour of information technology users in developing countries. However, a newly developed conceptual framework will help to enhance the development of the model in terms of additional independent variables of health consciousness. This study argues that the suggested extension of the UTAUT model contributes significantly to the literature because it is one of the few to explore variables impacting mHealth among young adults in developing nations. With additional factors in the mHealth context, the results support the UTAUT utility. Through the testing of hypotheses and further linking the findings to the empirical evidence derived from the existing literature, this study made a substantial theoretical contribution to the body of knowledge already in existence. In addition to theoretical contributions, these empirical results may provide information on the development of practical guidelines for the effective implementation of mHealth apps in Malaysia. On top of that, the study also strengthened the UTAUT with the variables such as EE, PE, SI, FC, and HC are considered as a more comprehensive measure in a way.

From a practical perspective, young adults are encouraged to look state of this M-health application among the respondents in this study. It is impossible for the respondents to generalize the findings to all Malaysian but at least the results showed some magnitude on the intention to use the M-health application among young adults in Malaysian. The majority of the respondents were optimistic about this new application whenever they believe this application would improve their daily health routine. They might not be among the vanguard adopters of the latest technologies but the findings tell the study that most of people are willing to embrace health applications for their daily life. Malaysian policymakers can use the study's findings to boost the adoption of mHealth

services among young adults. As a result, it is intended that the findings of this study will enlighten receivers about where and how mobile technology may be utilized to facilitate the delivery of health services in a way that young adults will accept. As a whole, this study depicts that the mHealth application is interesting and useful based on the finding of the intention to use the mHealth application. Furthermore, young adults are in the right state thus highlighting good prospects for the mHealth application and their nature to invest in this M-health application. Promoting the usage of this application definitely helps young adults to produce seamless and hassle-free applications that will spread the food word among users.

As a recommendation in future research, this study is quantitative in nature. It is appropriately justified when the researcher first decided to use UTAUT; the theory is a quantitative measure comprising 22 items. This study could have more 'path-breaking' had the study injected a qualitative element in this study but considering the number of items in the questionnaire, then the idea of conducting a mixed method was withdrawn. Therefore, for a more far-reaching conclusion, it is recommended that mixed methodology should be considered as human behaviour, in some cases is not fully captured through a structured survey questionnaire. In addition, this study also may be added some other aspects of customer perceived value that should be integrated with customer behaviour for future research. A good emphasis on customer perceived value is therefore critical in influencing their responses, especially their behavioural intention.

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